(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 375 196 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent: **14.08.1996 Bulletin 1996/33**

(51) Int. Cl.[6]: **B65H 3/10**, B65H 29/54, B65H 31/24

(21) Application number: **89312640.9**

(22) Date of filing: **05.12.1989**

(54) Method and apparatus for the sequential handling of flexible products

Verfahren und Einrichtung zum Behandeln von aufeinanderfolgenden flexiblen Produkten

Méthode et dispositif pour manipuler séquentiellement les produits flexibles

(84) Designated Contracting States:
BE CH DE ES FR GB IT LI NL SE

(30) Priority: **19.12.1988 US 286205**

(43) Date of publication of application:
27.06.1990 Bulletin 1990/26

(73) Proprietor: **DowBrands Inc.**
Indianapolis Indiana 46268 (US)

(72) Inventors:
- **Smith, David A.**
  Midland Michigan 48640 (US)
- **Geiger, Herb**
  Bay City Michigan 48706 (US)

(74) Representative: **Allard, Susan Joyce et al**
BOULT, WADE & TENNANT
27 Furnival Street
London EC4A 1PQ (GB)

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EP 0 375 196 B1

Printed by Rank Xerox (UK) Business Services
2.13.0/3.4

Description

This invention relates to a method and apparatus for the sequential handling of a series of individual flexible products, and more particularly to a high speed handling and delivery system for flexible plastic bags or containers.

US-A-4190241 discloses an apparatus for converting rolls of paper web into stacks of folded sheets on a continuous high speed basis including slitting a supply roll into plural narrow webs, folding the narrow webs longitudinally, cutting the folded webs transversely into sheets of suitable length, pre-stacking continuous streams of adjacent folded sheet emerging from the cutters before they are carried into a final stacking mechanism.

US-A-3687447 discloses an apparatus for stacking thermoplastic bags which have weld seams extending transversely to the direction in which they are received, the apparatus enabling the bags to be stacked accurately with their edges aligned.

In the production of individual flexible web products such as plastic containers and bags, the bag stock is typically supplied in the form of a continuous web of thermoplastic material which has been folded upon itself to form two plies. In forming individual bags, portions of the thermoplastic material are severed from the web. These severed areas become side seams for the bags and are typically sealed at the same time as they are severed by the use of a heated wire element. The bags are then stacked, counted and packaged by packing equipment.

The severing and sealing operation typically takes place on a relatively large diameter rotating drum which may contain multiple heated wire severing and sealing elements positioned in grooves located within the outer periphery of the drum. As the drum rotates, different severing and sealing elements are actuated to raise them up to the drum surface to sever and seal a respective portion of the bag stock web. The individual bags are retained on the drum by vacuum arrangement as the drum rotates. Such drums are large and expensive pieces of equipment. However, they can presently be operated at production speeds in excess of the production speed of the packaging equipment. Present commercial drums are capable of operating simultaneously on a pair of bag webs positioned side-by-side on the drum.

Individual bags are then taken from the drum, stacked and packaged. Desirably, the packaging operation occurs at the highest possible speed the equipment can be operated to increase productivity of the system. Presently, individual bags are taken from the drum by a smaller transfer drum, also suitably equipped with vacuum capabilities. The vacuum on the bags on the large drum is relieved at an appropriate point, and the bags fall onto the smaller drum where they are held in position by a vacuum. At an appropriat point, the vacuum is released and the individual bags are pulled off the smaller drum by an orbital packer or similar device. Again, present commercial equipment is designed to remove side-by-side pairs of bags simultaneously and package those bags with separate pieces of packaging equipment.

As is conventional, the orbital packing device is provided with a set of packer fingers which move in a circular path in precise timing with the smaller drum so that the fingers remove successive bags, which are typically separated on the drum approximately a nominal 3 mm from each other, from the drum and stack them on a staking table against a backstop. These orbiting packer fingers must move at very high speeds to strip each successive bag from the drum and may actually accelerate the bags toward the backstop. Such acceleration of the bags is undesirable as the bags may bounce or crumple when they hit the backstop. This leads to jamming, causing excessive downtime for the machinery.

Even if the machinery does not jam, the stack of bags which is formed on the stacking table may be uneven so that when the stack is boxed, bags may be left hanging out of the box. Such boxes must be removed from the assembly line and repacked by hand. Even minor unevenness of the bag stack may make it more difficult for a consumer to dispense the bags from a box. If one or more of the bags in the stack is crumpled, the vertical height of the stack is affected so that when the count fingers are activated to separate the previous precounted stack from the next stack, the fingers may strike the stack. Again, this leads to jamming and downtime for the machinery.

Another problem in conventional orbital packing devices is that the packer fingers contact substantially less than the full bag width as they move out of the grooves and strip the bag from the surface of the transfer drum. At typical operating speeds, the fingers accelerate the bags vertically downwardly away from the transfer drum surface at a high velocity. In some instances, this may cause the trailing edge of a bag, which is not in contact with the packer fingers, to fold up and over again itself. Longer packer fingers which would extend across the entire width of the bag are not possible in conventional equipment as the fingers would tend to contact the leading edge of the next succeeding bag on the drum. A folded bag placed on the bag stack again affects the height of the stack so that the count fingers may not operate properly to remove the stack from the stacking table. Additionally, such a folded bag may also cause a jam from the next bag striking the folded trailing edge.

Both the orbiting packer fingers as well as the count fingers are subjected to high inertial forces. After a predetermined number of bags have been removed, count fingers or other suitable separation means are actuated to separate the continuous stream of individual bags into precounted stacks. To accomplish this, the count fingers must move from a first position fully out of the stream of bags, to a second position fully in the stream. This movement must be accomplished in the fraction of

a second between successive bags as they are delivered from the smaller drum. At high production rates, this time can be less than 0.1 s conds. This results in the production of tremendous acceleration forces on the count fingers as high as 30 times the force of gravity. High inertial forces als affect the remainder of the packaging system for the folding and loading of the product into dispensers. Thus, operation at the design limits of the packing equipment results in high inertial loading which is detrimental to machinery life and results in excessive downtime and maintenance costs.

Attempts have been made in the past to increase the production rates of packing systems by providing multiple lane stacking systems for relatively thick and/or stiff products such as diapers (Campbell, U.S. Patent No. 4,523,671) and slices of wrapped cheese or meat (Driessen, U.S. Patent No. 3,683,730). Both Campbell and Driessen teach systems for the side shifting of individual items from a single path to a plurality of paths. However, such systems were not designed for the stacking of relatively thin, flexible products such as plastic bags which may become folded over and cause machine jamming.

Accordingly, it would be desirable to be able to utilize the capability of the product drum to produce products at the higher rates that it is capable of and yet maintain or even increase the higher production rates without subjecting the packaging system to such high inertial forces. The need still exists in the art for such a high speed product handling and delivery system and method for handling relatively thin, flexible products such as plastic bags.

The present invention meets those needs by providing an improved apparatus and method for the sequential handling of a series of flexible products which enables operation of the orbital packing fingers at lower speeds to reduce inertial loading and yet maintain a high overall output rate. Further, the orbital packing fingers themselves are constructed to extend across substantially the entire width of the bags as they are stripped from a transfer drum and to decelerate the bags as they are stacked against a backstop. Further, the surfaces of the packing fingers in contact with the bags may be designed to provide selective frictional drag to decelerate the bags as they are removed from a transfer drum and stacked.

In accordance with one aspect of the present invention, there is provided an apparatus for the production and sequential handling of individual flexible thermoplastic bags comprising:

means for severing and sealing a continuous folded web of thermoplastic material and forming a series of individual thermoplastic bags;

means for delivering the series of flexible thermoplastic bags to a transfer point;

means positioned at said transfer point for transferring said flexible thermoplastic bags to a delivery point,

characterized by

said means for severing and sealing including a plurality of seal bar assemblies and a plurality of heated wire severing and sealing element assemblies ;

said means for transferring the thermoplastic bags to a delivery point including a vacuum transfer drum having a plurality of annular grooves about the periphery thereof and means for rotating said drum;

a shaft mounted adjacent said transfer drum for orbital movement, including drive means for orbiting said shaft;

a plurality of fingers secured to said shaft and extending into said annular grooves for removing said flexible products from said transfer drum and delivering the flexible thermoplastic bags to said delivery point;

means for spacing the thermoplastic bags on the transfer drum to enable the packer fingers to remove the thermoplastic bags from the transfer drum without encountering a succeeding bag;

the fingers removing successive individual flexible thermoplastic bags sequentially from the transfer drum and the fingers having surfaces adapted to contact said flexible thermoplastic bags, said surfaces of the fingers in contact with the bags providing selective frictional drag to decelerate the bags as they are removed from the transfer drum and stacked against a back stop, and said fingers extending and contacting across substantially the full width of said flexible thermoplastic bags without contacting the leading edge of the next succeeding bag on the transfer drum as said flexible thermoplastic bags are removed from said transfer drum and stacked against a back stop.

The surface of the fingers in contact with the flexible products are designed to provide a selective frictional drag between the flexible products and the finger in that a high degree of friction is provided when the flexible products are moving at a high velocity relative to the finger surfaces and a low degree of friction is provided when the velocity of the finger surfaces is increasing relative to the velocity of the flexible products. This frictional drag tends to decelerate the flexible products as they are stacked, reducing bag crumpling, fold over, and bounce problems.

To enable operation of the orbital packing fingers at lower speeds and yet maintain the overall output of the system constant, the packing of the flexible products on the transfer drum should be increased to from approximately 9 mm between individual products to up to an entire bag width. This increased spacing may be accomplished in a number of ways. Initially, the surface speed of the transfer drum may be increased so that it is greater than the surface speed of the product drum. In this manner, individual flexible products removed from the product drum will be spaced out about the periphery of the transfer drum. Other techniques may employ a side-shifting transfer drum to provide to or more lanes of product to the orbital packing equipment as taught in commonly assigned copending U.S. Application Serial No. 200,283 filed May 31, 1988, or a plurality of transfer

drums as taught in commonly assigned copending U.S. Application Serial No. 159,133, filed February 23, 1988.

In one embodiment of the invention in which a side-shifting transfer drum is utilized, a high speed multiple lane system for delivering a series of individual flexible products to a plurality of delivery points is provided and includes means for providing a series of individual flexible products to a transfer point and means for transferring individual ones of the flexible products from the transfer point to a plurality of delivery points. The transfer means includes a vacuum transfer drum having a plurality of annular grooves about the periphery thereof, and also includes means for rotating the vacuum transfer drum.

The transfer drum also includes a plurality of alternating first and second segments, the first segments being movable transverse to the path of movement of the flexible products. These first segments are adapted to accept alternating ones of the flexible products from the transfer point and include vacuum ports in communication with the vacuum source for securing the leading edges of the flexible products. The second segments are adapted to accept alternating ones of the flexible products. Means are also provided for moving the first segments transverse to the path of movement of the flexible products.

Adjacent the transfer drum is an orbital packing mechanism including a shaft positioned for orbital movement, drive means for orbiting the shaft, and a plurality of packer fingers secured to the shaft, and extending into the annular grooves on the transfer drum for removing the flexible products sequentially from the first and second segments on the transfer drum and delivering them to the plurality of delivery points. The fingers have surfaces adapted to contact the flexible products. Optionally, the fingers extend and contact across substantially the full width of the flexible products as the products are removed from the transfer drum.

For the extended length packing fingers used in this embodiment of the present invention which utilizes side-shifting transfer drum segments, it is preferred that the grooves in the periphery of the transfer drum have a width of about twice the width of the fingers. The grooves may also include a tapered entry section to facilitate movement of the fingers into and out of the grooves on the transfer drum. If desired, guides may be positioned adjacent individual ones of the fingers for maintaining the fingers in alignment with the grooves.

Because each set of packer fingers at a packing station removes only alternating ones of the flexible products, there is sufficient space so that the longer fingers will not encounter a succeeding product. Further, due to this arrangement, each packing station may be operated at only 1/X the speed of a conventional machine, where X is the number of packing stations per lane of flexible products. Currently, commercial product drums are capable of operating on two or more lanes of flexible web products simultaneously. This lower perating speed reduces inertial loading forces on the finger mechanisms and also eliminates bag acceleration problems. However, as the number of stations of packing fingers has been increased, the overall output of the packaging machinery remains the same.

In this embodiment of the invention, and in the embodiments described below utilizing a plurality of transfer drums, the velocity of the fingers relative to the velocity of the flexible products as the products are removed from the transfer drum is of a magnitude and direction which will tend to decelerate the flexible products. This relative velocity is measured along the line of contact between the surface of the fingers and the flexible products. This deceleration of the flexible products as they are removed from the transfer drum and stacked on the stacking table against a backstop reduces bag crumpling, fold over and bounce problems.

In another embodiment of the invention, in which a plurality of transfer drums are utilized, a high speed product delivery system is provided which includes means for providing a series of individual flexible products sequentially to a transfer point and means for transferring individual ones of the products from the transfer point to a plurality of delivery points. The transfer means includes a plurality of vacuum transfer drums, with each of the drums having a plurality of annular grooves about the periphery thereof and means for rotating the drums. The drums are arranged such that the first of the plurality of transfer drums accepts products from the providing means and transfers at least a portion of the individual products to a succeeding transfer drum and at least a portion of the individual products to a first delivery point. Each succeeding transfer drum is positioned to deliver at least that portion of the individual products received from the first transfer drum to succeeding delivery points.

Adjacent each of the plurality of transfer drums at individual delivery points is an orbital packing mechanism including a shaft positioned for orbital movement, drive means for orbiting the shaft, and a plurality of packer fingers secured to each shaft and extending into the annular grooves on the transfer drums for removing the flexible products sequentially from the transfer drum and delivering them to the plurality of delivery points. The fingers have surfaces adapted to contact the flexible products. Optionally, the fingers extend and contact across substantially the full width of the flexible products as the products are removed from each of the transfer drums.

In an alternate embodiment of the invention which also utilizes a plurality of transfer drums, the handling and delivery system includes means for providing a series of individual flexible web products sequentially to a plurality of transfer points positioned about the periphery of a means for providing the products such as a rotating product drum.

The system also includes means for transferring individual products from each of the transfer points to a plurality of corresponding delivery points. The transfer means include a plurality of vacuum transfer drums and

means for rotating those drums. The drums are so arranged that the first of the transfer drums accept products from the product drum at succeeding transfer points.

Adjacent each of the plurality of transfer drums at individual delivery points is an orbital packing mechanism including a shaft positioned for orbital movement, drive means for orbiting the shaft, and a plurality of packer fingers secured to each shaft and extending into the annular grooves on the transfer drums for removing the flexible products sequentially from the transfer drum and delivering them to the plurality of delivery points. The fingers have surfaces which are adapted to contact the flexible products. Optionally, the fingers extend and contact across substantially the full width of the flexible products as the products are removed from each of the transfer drums.

The present invention also provides a method for the sequential handling of individual flexible thermoplastic bags comprising the steps of:

severing and sealing a continuous folded web of thermoplastic material and forming a series of individual flexible thermoplastic bags,

delivering a series of individual flexible thermoplastic bags to a transfer point;

transferring the flexible thermoplastic bags from the transfer point to one or more delivery points; characterized by

carrying out the severing and sealing by means of a plurality of seal bar assemblies and a plurality of heated wire severing and sealing element assemblies ;

transferring the flexible thermoplastic bags onto a rotating vacuum transfer drum having a plurality of annular grooves about the periphery thereof; and

removing the flexible thermoplastic bags sequentially from the transfer drum and delivering them to and one or more delivery points using a plurality of fingers which extend into the annular grooves and remove the flexible thermoplastic bags sequentially from the transfer drum and deliver them to the one or more delivery points, the fingers having surfaces adapted to contact the flexible thermoplastic bags, said surfaces of the fingers in contact with the bags providing selective frictional drag to decelerate the bags as they are removed from the transfer drum and stacked against a back stop, and the fingers extending and contacting across substantially the full width of the flexible thermoplastic bags as the thermoplastic bags are removed from the transfer drum and stacked against a back stop.

In those embodiments of the invention which utilize a plurality of transfer drums or a transfer drum with side-shifting segments, preferably the relative velocity of the surface of the fingers in contact with the flexible products is equal to or less than the velocity of the flexible products as the products are removed from the transfer drum. In these embodiments of the invention, the orbital packing fingers may be operated at 1/X the rate at which the sequential flexible products are moving on the product drum, where X is the number of packing stations per lane of flexible products or the total number of transfer drums. Thus, fewer inertial forces are imposed on the orbital packing mechanism whil maintaining the same overall packaging capacity of the machinery.

Accordingly, it is an object of the present invention to provide an apparatus and method for the sequential handling and delivery of individual flexible products without subjecting the apparatus to high inertial loading which is detrimental to the apparatus. It is a further object to provide a method and apparatus which improves the stacking of flexible products and reduces product jams and machinery down time. These, and other objects and advantages of the present invention will become apparent from the following detailed description, the accompanying drawings, and the appended claims.

Figure 1 is a schematic side elevational view of one embodiment of the sequential handling and delivery system of the present invention;

Figure 2A is a schematic side elevational view of a dual transfer drum embodiment of the sequential handling and delivery system of the present invention;

Figure 3 is a schematic side elevational view of another dual transfer drum embodiment of the sequential handling and delivery system of the present invention;

Figure 4 is an enlarged side elevational view of one of the transfer drums shown in Figure 2 illustrating the orbital movement of the packer fingers;

Figure 5 is an enlarged front elevational view taken along line 5--5 in Figure 4 illustrating the packer fingers within the annular grooves in the drum;

Figure 6 is a schematic side elevational view of a side-shifting transfer drum embodiment of the sequential handling and delivery system of the present invention;

Figure 7 is a sectional view, taken along line 7--7 in Figure 6; and

Figure 8 is a front elevational view taken along line 8--8 in Figure 7.

Referring now to Figure 1, one embodiment of the sequential product handling and delivery system 10 of the present invention is illustrated in schematic form. The handling and delivery system 10 receives a continuous film web 12 from a spool (not shown) or directly from an extrusion line. While the invention will be described in the context of a web of thermoplastic material used to form individual plastic bags or containers, it will be apparent to those skilled in the art that the handling and delivery system of the present invention is applicable to other products which are fed from a continuous web and then divided into individual flexible products.

Film web 12 may be provided with interlocking closure members at opposite sides of the film web. The closure members may be in either a zippered or an

unzippered condition when the bag stock is folded on itself to provide a two ply film. Film web 12 is caused to pass over dancer roll 14 which acts to control film web tension based on its vertical positioning. Film web 12 is then pulled through a draw roll arrangement 16 which is driven at a speed slightly in excess of th rotational speed of a vacuum product drum 24. This type of operation permits some slack in the film as it is being fed onto drum 24. The drum 24 is driven by drive means (not shown) in a conventional manner. The film web 12 then passes over a lay-on roll 18 which is located to position the film web accurately against the rotating product drum surface.

Film web 12 is then severed and sealed on product drum 24 in the following manner. Film web 12 is clamped tightly to the outer surface of product drum 24 at a severing and sealing edge of a heating element slot 21 by seal bar assembly 20. Seal bar assembly 20 is aligned in proper positions through the use of yokes 22 on the product drum 24. As product drum 24 rotates in the direction of the arrow, heated wire severing and sealing element assembly, shown generally at 26, operable through a cam assembly (not shown), emerges from a recess in product drum 24 and severs film web 12 at position A.

The severing and sealing element remains extended for approximately 120 degrees of rotation of the product drum until the severing and sealing element 26 is withdrawn as shown schematically at position B. During the time that the element is extended, the film melts back to the edge of the seal bar assembly 20 and a bead seal forms along the edge of the bag. This melt back of the thermoplastic film results in a nominal 3mm spacing between adjacent bags on product drum 24. The spacing further aids in preventing adjacent bags from touching and resealing to each other. Individual bags 28 are formed by the severing and sealing of the film web at adjacent sever and seal stations on the product drum.

Just prior to the release of the clamping force of the seal bar assembly 20, a vacuum is applied to the leading edge of individual bags 28. Seal bar assembly 20 is removed from the product drum by a continuous chain drive 30 having sprockets 32 and 34 located on opposite sides of product drum 24. The chain drive permits precise positioning of the individual seal bar assemblies 20 along the surface of the product drum.

Individual bags 28 are held in position on rotating product drum 20 by respective vacuum ports 36 which communicate with a central manifold 38, which in turn communicates with a vacuum source (not shown). As shown, as product drum 24 rotates, vacuum ports 36 are brought into and out of communication with manifold 38. This construction causes a vacuum to be applied to the leading edges of bags 28 beginning at a point just prior to the removal of seal bar assembly 20 until just prior to transfer to transfer drum 40.

Bags 28 are held ont rotating transfer drum 40 by a similar vacuum system. Vacuum ports 42 communicate with a central manifold 44, which in turn communicate with a vacuum source (not shown). As shown, at a point approximately along a line between the centers of product drum 24 and transfer drum 40, the vacuum is relieved from product drum 24. Gravity then causes the bags 28 to fall toward drum 40 where a corresponding vacuum port 42 is activated.

The vacuum ports 42 on transfer drum 40 are positioned so that each individual bag 28 is removed from the product drum. As shown, each vacuum port is active during rotation of first transfer drum 40 until a point approximately in vertical alignment with packing device 60. As bags 28 are brought around transfer drum 40, vacuum ports 42 hold onto the bags until they reach a nearly horizontal position where the vacuum is released.

In packing device 60, orbital packer fingers 62 extend into annular grooves on the surface of transfer drum 40 and pull the individual bags away from the drum surface and deposit the bags into a stack 64 on delivery table 65. As shown by the phantom lines, as well as by the view in Figure 4, fingers 62 extend substantially horizontally but it will be appreciated that the packing device and associated components may be positioned at an acute angle from the horizontal configuration shown.

The surface of fingers 62 which contact bags 28 may be specially treated or finished to provide a selective frictional drag between the flexible products and the surfaces of the fingers. By selective frictional drag it is meant to provide a high degree of friction during the time when bags 28 are moving at a high velocity relative to the finger surface and a low degree of friction when the velocity of the finger surfaces is increasing relative to the velocity of the flexible products. As shown in Figures 2B and 2C, the selective frictional drag may be provided through the use of an elongated saw tooth pattern 62a, or a series of angled projections 62b. Other known techniques for producing such surfaces may be utilized, such as for example, the use of a "fish scale" pattern as is used on the bottoms of cross country skis. This high degree of friction will tend to decelerate the bag as it is stacked on table 65.

At a precise time, count fingers 66 pivot between a first position (not shown) which is completely out of the stream of bags into the position shown to separate the stack 64 of bags into the desired count. The delivery table 65 may be lowered to permit a clamp assembly (not shown) to clamp the stack of bags and transfer it to further conventional equipment for packaging the bags.

In the embodiment of the invention illustrated in Figure 1, to enable the longer packer fingers 62 to strip bags 28 from drum 40 without encountering a succeeding bag, the spacing between the individual bags must be increased from the nominal 3 mm on the product drum to up to an entire bag width. This is accomplished in the system of Figure 1 by operating transfer drum 40 at a surface speed which is somewhat gr at r than the surface speed of product drum 24. T accomplish this,

drum 40 may be rotated at the same nominal rate as the transfer drums in other embodiments of the invention but will have a larger diameter. Thus, the speed of the outer surface of the transfer drum will increase. Care must be taken in selecting the surface speed of the transfer drum so that bags 28 are not accelerated unduly as they are transferred from product drum 24.

In another embodiment of the invention illustrated in Figure 2A, in which like reference numerals refer to like elements, a plurality of transfer drums are utilized. The operation of the system is similar to the embodiment of the invention illustrated in Figure 1 except that first transfer drum 40 is equipped with two sets of vacuum ports 42 and 46. A first set of vacuum ports 42 communicate with a first central manifold 44 which, in turn, communicates with a vacuum source. A second set of vacuum port 46 communicate with a second central manifold 48 which, in turn, communicates with the vacuum source (not shown). As shown, at a point approximately along a line between the centers of product drum 24 and first transfer drum 40, the vacuum is relieved from product drum 24. Gravity then causes the bags 28 to fall toward drum 40 where a corresponding vacuum port 42 is activated.

The first and second sets of vacuum ports 42 and 46 on transfer drum 40 are positioned so that each individual bag 28 is removed from the product drum. As shown, each set of vacuum ports is active during rotation of the first transfer drum 40 until a point approximately along the centerline between first transfer drum 40 and second transfer drum 50. At that point, bags 28 secured to ports 42 will be released and then picked up by the vacuum system on transfer drum 50. Bags 28 will be transferred to second transfer drum 50 by vacuum ports 52 which communicate with a central manifold 54 which in turn communicates with a vacuum source (not shown).

In this manner, the stream of individual bags may be divided into two streams which can then be delivered to separate packing devices 60 and 70 which operate as previously described. However, since each packing device encounters only one-half of the total number of bags coming from product drum 24, the packing fingers on each device are operated at exactly one-half the rate of previous systems. It will be appreciated that additional transfer drums may be positioned in series with the dual drum arrangement shown, or positioned about the periphery of the product drum as shown in greater detail in the Figure 3 embodiment below. Thus, the packing fingers may be operated at 1/X the rate of previous systems, where X is the total number of transfer drums. Thus, for a four transfer drum system, packers fingers 62 would be operated at 1/4 the rate of previous systems.

Further, it has been found that the orbit diameter of the packer fingers plays a role in the velocity of the fingers relative to the bags as th y are r moved from the product drum. As previously stated, it is desirabl for the relative velocity of the packer fingers to be equal to or less than the velocity of the bags as they are removed. This tends to cause the bags to decelerate as they are removed and stacked against a backstop. For a given number of orbits per unit of time, the velocity of the packer fingers will be π x d times the number of orbits, where d is the diameter of the orbit. Thus, the smallest practical diameter orbit for the packer fingers is preferred as this will be the condition where the velocity of the packer fingers relative to the velocity of the bags is most likely to be a negative number (i.e., the relative velocity is in a direction opposite the velocity of the bags and will tend to decelerate the bags). It has been found that if the ratio of the orbit diameter to the bag width (i.e., the product width or repeat length in the machine direction on the product drum) is less than or equal to about 0.7, the velocity of the surface of the packer fingers relative to the initial velocity of the bags (initial velocity being the velocity as the bag is stripped from the drum) will be a negative number for the entire time of contact between the two. This operating condition tends to decelerate the bags as they come into contact with the slower moving fingers, reducing bag crumpling, fold over, and bounce problems as the bags are stacked.

Figure 3 illustrates an alternate embodiment of the invention illustrated in Figure 2A. Again, like reference numerals represent like elements. The first and second transfer drums 40 and 50, respectively, are positioned at different transfer points around the periphery of product drum 24. As shown, in this embodiment, product drum 24 is equipped with a first set of vacuum ports 26 as well as a second set of ports 37. Each set of ports communicates with respective central manifolds 38, 39 which communicate with a vacuum source (not shown). With the product and transfer drums rotating in the directions indicated by the arrows, it can be seen that the vacuum on ports 36 is released at a point approximately along The centerline between the product drum 24 and first transfer drum 40.

Bags 28 transferred to first transfer drum 40 are then delivered to packing device 60 for stacking and counting as previously described. That portion of the bags which are held by ports 37 are carried with product drum 24 until the vacuum is released at a point approximately along the centerline between product drum 24 and second transfer drum 50. Again, bags which are released to second transfer drum 50 are then delivered to packing device 70 for stacking and counting. Also again, the packing fingers in each device need only be operated at 1/X the rate of the total number of bags coming from product drum 24, where X is the number of transfer drums used.

The positioning and operation of packer fingers 62 is best shown in Figures 4 and 5, with reference to the embodiment of the invention illustrated in Figure 3. As shown, a series of packer fingers 62 extend into a corresponding series of annular grooves extending ar und the surface of transfer drum 50. The length of the fingers is such that when they fully engage the product, as shown in Figure 4, th ends of the fingers extend sub-

stantially across the full width of bags 28 as the bags are stripped from drum 50. Such full contact by the fingers prevents bag fold over problems as the bags are removed from the drum and stacked.

Also illustrated in Figure 4 are portions of the orbital packing machinery for driving the fingers. The operation of the fingers is shown to be a generally circular orbit. However, other configurations such as elliptical orbits may be utilized. A tube 91, which extends transversely of the packing machine, is equipped with a bracket 92 which carries packer fingers 62. Tube 91 is connected at each of its ends to crank mechanisms (not shown) which are carried on rotating shaft 94. Tube 91 is also connected to a second crank mechanism 96 by means of a connecting bar 98. Shaft 94 is driven by suitable drive means (not shown). The construction and operation of the orbital packer is described in greater detail in U.S. Patent No. 3,640,050.

Referring now to Figures 6 and 7, yet another embodiment of the present invention utilizing a side-shifting transfer drum is illustrated in schematic form. Like reference numerals again represent like elements. The operation of the system is as previously described except for the construction of transfer drum 40. Transfer drum 40 is driven by suitable drive means (not shown) through shaft 41. Alternatively, shaft 41 may be fixed, and transfer drum 40 rotated about the shaft. Transfer drum 40 includes a plurality of segments 42a and 42b. In the preferred form of the invention as shown, segments 42a and 42b alternate about the periphery of the drum with segments 42a being fixed while segments 42b are movable transversely to the direction of rotation of drum 40.

Both fixed segments 42a and movable segments 42b include a first set of vacuum ports 44 in communication with a central manifold 48. Manifold 48 is in turn in communication with a vacuum source (not shown). As shown, vacuum ports 44 are positioned to secure the leading edges of each of the respective bags 28 as they are transferred to drum 40.

Segments 42b also include a second set of vacuum ports 46 which are in communication with a central manifold 50. Manifold 50 is in turn in communication with a vacuum source (not shown). Both manifolds 48 and 50 are part of a housing 47 which is located on the side of drum 40. Vacuum ports 46 are positioned to secure the trailing edges of bags 28 as they are transferred to drum 40. By securing both the leading and trailing edges of bags 28 to the movable segments, wrinkling or folding of the bags is prevented during transverse movement thereof.

Referring now to Figure 7, the structure and operation of transfer drum 40 are illustrated in greater detail. Drum 40 is mounted on drive shaft 41 which is in turn supported in a sleeve 51 secured to center support plate 52. Bearings permit the rotation of drum 40 around fixed sleeve 51. For ease of explanation, only one half of transfer drum 40 is shown in Figure 7. It will be appreciated that a mirror image of the portion of the drum which is illustrated extends from the opposite side of center support plate 52 and is partially shown in phantom lines.

Positioned within drum 40 is a cam 56 having a cam track 58. Cam 56 is secured to sleeve 51 by suitable means. A cam follower 60 secured to each movable segment 42b, such as by bracket 62, rides in cam track 58. Movable segments 42b are also mounted on bearings or the like for transverse movement on slide bars 64. Rotation of drum 40 about its longitudinal axis causes movable segments 42b to translate as shown along slide bars 64 to move from position C in alignment with bags from product drum 24 at the transfer point between the two drums, to position D at the opposite side of transfer drum 40.

Fixed segments 42a have finger segments 68 with annular grooves 69 therebetween to facilitate removal of the bags 28 by the orbital packing fingers on the orbital packing device described in greater detail below. Flexible vacuum hose 70 supplies a source of vacuum from manifold 48 to vacuum ports 44 on the surface of segments 42a to secure the leading edges of bags 28 thereto.

Movable segments 42b also preferably include finger segments 68 having annular grooves 69 therebetween. As shown in Figure 8, grooves 69 may have tapered entry sections 69a to facilitate movement of the finger segments 68 into and out of the grooves. Further, grooves 69 are designed to be about twice the width of finger segments 68 for movable segments 42b. Finally, optionally, vertical guides 70 best shown in Figure 4, may be positioned alongside individual ones of the finger segments for maintaining the fingers in alignment with grooves 69. All of these features allows for and/or correct any misalignment of the fingers and grooves due to the extended length of the fingers and the side-shifting of the segments on the transfer drum. Flexible vacuum hoses 72 and 74 provide a source of vacuum from manifolds 48 and 50, respectively, to vacuum ports 44 and 46 on the surface of the movable segments. In this manner, both the leading and trailing edges of bags 28 are secured to movable segments 42b.

In operation, pairs of bags 28 are transferred from product drum 24 to transfer drum 40 as the two drums rotate in opposite directions. At the point of transfer, the vacuum on the leading edge of the bag on the product drum is released and the bag falls onto transfer drum 40 where the leading edge is immediately secured by vacuum ports 44. It will be understood that bags 28 will fall sequentially onto either a fixed segment 42a or movable segment 42b. As transfer drum 40 continues to rotate, if the bag is on a movable segment 42b, vacuum ports 46 will be activated to secure the trailing edge of the bag.

As drum 40 rotates, both fixed and movable segments 42a and 42b are positioned directly beneath the transfer point on product drum 24. As drum 40 continues to rotat , movable segments 42b will begin to translate laterally as cam 56 causes cam follower 60 to move laterally in cam track 58. At a predetermined point in the rotation of drum 40, movable segments 42b are at their

outwardmost position on drum 40, in alignment with packing device 76. Fixed segments 42a continue to rotate in alignment with packing device 78.

As illustrated in Figure 7, the predetermined point at which movable segments 42b reach their outwardmost travel is approximately 180 degrees from the transfer point between drums 24 and 40. Cam 56 is designed so that after reaching the point of outermost travel and transferring the bags to the packing equipment, movable segments 42b begin to translate inwardly so that they are back into alignment with the streams of bags leaving product drum 24 by the time that drum 40 rotates them back to that position.

In this manner, the two streams of individual bags may be divided into four streams which can then be delivered to separate packing devices. The operation of those packing devices is the same and will be described in greater detail in relation to device 76, as best shown in Figure 6. As bags 28 are brought around transfer drum 40, the bags secured by vacuum ports 44 hold onto the bags until they reach a nearly horizontal position where the vacuum is released. Also as shown, those movable segments 42b in which the trailing edges of the bags are secured by vacuum ports 46 have that vacuum released just prior to reaching the transfer point and after the segments have been side-shifted to their outermost point.

In packing device 76, orbital packer fingers 84 extend into annular grooves 69 and pull the individual bags away from the drum surface and then deposit the bags into a stack 86 on delivery table 88. As shown in phantom lines, the fingers are designed to extend across substantially the entire width of the bags as they are removed form the transfer drum. At a precise time, count fingers 90 pivot between the position shown in phantom lines completely out of the stream of bags into the position shown to separate the stack 86 of bags into the desired count. The delivery table 88 may be lowered to permit a clamp assembly (not shown) to clamp the stack of bags and transfer it to further conventional equipment for packaging the bags.

Claims

1. An apparatus for the production and sequential handling of individual flexible thermoplastic bags comprising:

   means (20,26) for severing and sealing a continuous folded web of thermoplastic material and forming a series of individual thermoplastic bags (28);

   means (24) for delivering the series of flexible thermoplastic bags to a transfer point;

   means (40) positioned at said transfer point for transferring said flexible thermoplastic bags to a delivery point,

   characterized by

   said means for severing and sealing including a plurality of seal bar assemblies (20) and a plurality of heated wire severing and sealing element assemblies (26);

   said means for transferring the thermoplastic bags to a delivery point including a vacuum transfer drum (40) having a plurality of annular grooves (69) about the periphery thereof and means (41) for rotating said drum;

   a shaft (94) mounted adjacent said transfer drum (40) for orbital movement, including drive means for orbiting said shaft;

   a plurality of fingers (62) secured to said shaft and extending into said annular grooves for removing said flexible thermoplastic bags from said transfer drum and delivering the flexible thermoplastic bags to said delivery point;

   means for spacing the thermoplastic bags on the transfer drum (40) to enable the packer fingers (62) to remove the thermoplastic bags (28) from the transfer drum (40) without encountering a succeeding bag;

   the fingers (62) removing successive individual flexible thermoplastic bags sequentially from the transfer drum and the fingers having surfaces adapted to contact said flexible thermoplastic bags, said surfaces of the fingers in contact with the bags providing selective frictional drag to decelerate the bags as they are removed from the transfer drum and stacked against a back stop, and said fingers extending and contacting across substantially the full width of said flexible thermoplastic bags without contacting the leading edge of the next succeeding bag on the transfer drum as said flexible thermoplastic bags are removed from said transfer drum and stacked against a back stop.

2. An apparatus as claimed in claim 1 further characterized by:

   a plurality of delivery points;

   the transfer drum (40) including a plurality of alternating first and second segments, said first segments (42b) being movable transverse to the path of movement of said flexible thermoplastic bags, said first segments being adapted to accept alternating ones of said flexible thermoplastic bags from said transfer point and including vacuum ports (46) in communication with said vacuum source for securing the leading edges of said flexible thermoplastic bags, said second segments (42a) being adapted to accept alternating ones of said flexible thermoplastic bags, and means (56-64) for moving said first segments transverse to the path of movement of the flexible thermoplastic bags; and

   said means for transferring enabling individual thermoplastic bags to be transferred sequentially from said first and second segments to a plurality of delivery points.

3. An apparatus as claimed in claim 1 further characterized by:

a plurality of delivery points;

the transfer means including a plurality of vacuum transfer drums (40,50) each of said drums having a plurality of annular grooves about the periphery thereof, and means for rotating each of said transfer drums;

the transfer drums (40,50) being arranged such that the first of said plurality of transfer drums (40) accepts thermoplastic bags from said providing means (24) and transfers at least a portion of said individual thermoplastic bags to a succeeding transfer drum (50) and at least a portion of said individual thermoplastic bags to a first delivery point (60), each succeeding transfer drum (50) delivering at least that portion of said individual thermoplastic bags received from said first transfer drum (40) to each succeeding delivery point (70);

a plurality of shafts, one shaft mounted adjacent each of said transfer drums (40,50) for orbital movement, including a drive means for each shaft;

a plurality of fingers (62) being secured to each shaft and extending into said annular grooves on said transfer drums (40,50) and

said means for transferring enabling individual thermoplastic bags to be transferred sequentially from said transfer drums to the plurality of delivery points.

4. An apparatus as claimed in claim 1 further characterized by:

a plurality of delivery points;

means for providing a series of individual flexible thermoplastic bags sequentially to a plurality of transfer points;

means for transferring individual ones of said thermoplastic bags from each of said plurality of transfer points to a plurality of delivery points; and

said transfer means including a plurality of vacuum transfer drums (40,50), each of said transfer drums having a plurality of annular grooves about the periphery thereof, and means for rotating said transfer drums, said drums being arranged such that the first of said plurality of transfer drums (40) accepts thermoplastic bags from said providing means (24) at a first transfer point and each succeeding transfer drum (50) accepts individual thermoplastic bags from said providing means (24) at each succeeding transfer point, said first transfer drum delivering at least a portion of said individual thermoplastic bags to a first delivery point (60) and each succeeding transfer drum (50) located at each succeeding transfer point delivering at least a portion of said individual thermoplastic bags to succeeding delivery point (70); and

said means for transferring enabling individual thermoplastic bags to be transferred sequentially from said transfer drums to th plurality of delivery points.

5. Apparatus as claimed in any one of claims 1 to 4 wherein the surfaces of the fingers (62) have a saw-toothed pattern (620), a fish scale pattern or a series of angled projections (62b).

6. A method for the sequential handling of individual flexible thermoplastic bags comprising the steps of:

severing and sealing a continuous folded web of thermoplastic material and forming a series of individual flexible thermoplastic bags,

delivering a series of individual flexible thermoplastic bags to a transfer point;

transferring the flexible thermoplastic bags from the transfer point to one or more delivery points; characterized by

carrying out the severing and sealing by means of a plurality of seal bar assemblies (20) and a plurality of heated wire severing and sealing element assemblies (26);

transferring the flexible thermoplastic bags onto a rotating vacuum transfer drum having a plurality of annular grooves about the periphery thereof; and

removing the flexible thermoplastic bags sequentially from the transfer drum and delivering them to and one or more delivery points using a plurality of fingers which extend into the annular grooves and remove the flexible thermoplastic bags sequentially from the transfer drum and deliver them to the one or more delivery points, the fingers having surfaces adapted to contact the flexible thermoplastic bags, said surfaces of the fingers in contact with the bags providing selective frictional drag to decelerate the bags as they are removed from the transfer drum and stacked against a back stop, and the fingers extending and contacting across substantially the full width of the flexible thermoplastic bags as the thermoplastic bags are removed from the transfer drum and stacked against a back stop.

7. A method as claimed in claim 6, wherein the flexible thermoplastic bags are transferred from the transfer point to a plurality of delivery points and wherein the fingers are operated at a rate of 1/X times the rate that the flexible thermoplastic bags are provided to the transfer point, where X is the number of delivery points per lane of flexible thermoplastic bags delivered to the transfer point.

8. A method as claimed in claim 6 or claim 7, in which the ratio of the orbit diameter of the fingers to the width of the flexible thermoplastic bags is equal to or less than about 0.7.

9. An orbital packing apparatus (60) for use in combination with an apparatus for sequentially handling individual flexible thermoplastic bags said orbital packer for removing said thermoplastic bags from a

transfer drum comprising:

a shaft (94) mounted for orbital movement, including drive means for orbiting the shaft; and

a plurality of fingers (62) secured to the shaft (94); .

characterized in that

the fingers have surfaces adapted to contact the flexible thermoplastic bags, the surfaces providing a selective frictional drag between the flexible thermoplastic bags and the fingers in that a high degree of friction is provided when the flexible thermoplastic bags are moving at a high velocity relative to the finger-surfaces and a low degree of friction is provided when the velocity of the finger surfaces is increasing relative to the velocity of the flexible thermoplastic bags.

10. An apparatus as claimed in claim 9, in which the surfaces of the fingers (62) have a saw-toothed pattern (62a), a fish scale pattern or a series of angled projections (62b).

Patentansprüche

1. Vorrichtung zur Produktion und zum sequentiellen Transport einzelner flexibler thermoplastischer Beutel, bestehend aus

- einer Einrichtung (20, 26) zum Schneiden und Schweißen einer kontinuierlichen gefalteten Bahn thermoplastischen Materials und zur Bildung einer Reihe von einzelnen thermoplastischen Beuteln (28);
- einer Einrichtung zur Abgabe der Reihe von flexiblen, thermoplastischen Beuteln an eine Übertragungsstelle;
- einer Einrichtung (40), die an der Übertragungsstelle angeordnet ist, um die flexiblen, thermoplastischen Beute zu einer Abgabestelle zu übertragen,

dadurch gekennzeichnet, daß

- die Einrichtung zum Schneiden und Schweißen mehrere Schweißstangenanordnungen (20) und mehrere Heizdrahtschneid- und Schweißelementanordnungen (26) hat;
- die Einrichtung zur Übertragung der thermoplastischen Beutel an eine Übertragungsstelle eine Vakuumübertragungstrommel (40) mit mehreren ringförmigen Nuten (69) um deren Umfang und eine Einrichtung (41) zum Drehen der Trommel hat;
- eine Welle (94) nahe der Übertragungstrommel (40) für eine Umlaufbewegung angeordnet ist und eine Antriebseinrichtung zum Umlauf der Welle hat;
- mehrere Finger (62) an der Welle befestigt sind und sich in die ringförmigen Nuten zum Entfernen der flexiblen, thermoplastischen Beutel von der Übertragungstrommel und zur Abgabe der flexiblen thermoplastischen Beutel an di Abgabestelle erstrecken,
- eine Einrichtung zum Beabstanden der thermoplastischen Beute auf der Übertragungstrommel (40) vorhanden ist, damit die Umsetzfinger (62) die thermoplastischen Beutel (28) von der Übertragungstrommel (40) entfernen können, ohne auf einen nachfolgenden Beute zu treffen;
- die Finger (62), die aufeinanderfolgende einzelne flexible thermoplastische Beute sequentiell von der Übertragungstrommel entfernen, und die Finger Oberflächen haben, die die flexiblen thermoplastischen Beutel berühren können, wobei die Oberflächen der Finger, die die Beutel berühren, einen selektiven Reibungswiderstand erzeugen, um die Beutel zu verzögern, wenn sie von der Übertragungstrommel entfernt und gegen einen Anschlag gestapelt werden, und wobei sich die Finger im wesentlichen über die gesamte Breite der flexiblen thermoplastischen Beute erstrecken und diese berühren, ohne die Vorderkante des nextfolgenden Beutels auf der Übertragungstrommel zu berühren, wenn die flexiblen thermoplastischen Beutel von der Übertragungstrommel entfernt und gegen einen Anschlag gestapelt werden.

2. Vorrichtung nach Anspruch 1, weiterhin **dadurch gekennzeichnet, daß**

- mehrere Übertragungsstellen vorhanden sind;
- daß die Übertragungstrommel (40) mehrere abwechselnde erste und zweite Segmente aufweist, wobei die ersten Segmente (42) quer zur Bewegungsbahn der flexiblen thermoplastischen Beute verschiebbar sind, die ersten Segmente abwechselnde der flexiblen thermoplastischen Beute von der Übertragungsstelle aufnehmen können und Vakuumöffnungen (46) aufweisen, die mit der Vakuumquelle verbunden sind, um die Vorderkanten der flexiblen thermoplastischen Beutel festzuhalten, wobei die zweiten Segmente (42a) abwechselnde der flexiblen thermoplastischen Beute aufnehmen können, und Einrichtungen (56 bis 64) zum Verschieben der ersten Segmente quer zur Bewegungsbahn der flexiblen thermoplastischen Beutel aufweisen, und
- die Einrichtung zur Übertragung es ermöglicht, daß einzelne thermoplastische Beutel sequentiell von den ersten und zweiten Segmenten zu mehreren Abgabestellen übertragen werden.

3. Vorrichtung nach Anspruch 1, weiterhin **dadurch gekennzeichnet, daß**

- mehrere Abgabestellen vorhanden sind;

- die Übertragungseinrichtung mehrere Vakuumübertragungstrommeln (40, 50) aufweist, wobei jede der Trommeln mehrere ringförmige Nuten um deren Umfang hat, sowie Einrichtungen zum Drehen jeder Übertragungstrommeln;
- die Übertragungstrommeln (40, 50) derart angeordnet sind, daß die erste der mehreren Übertragungstrommeln (40) thermoplastische Beutel von der Abgabeeinrichtrung (24) aufnimmt und wenigstens einen Teil der einzelnen thermoplastischen Beute) an eine nachfolgende Übertragungstrommel (50) und wenigitens einen Teil der einzelnen thermoplastischen Beutel an eine erste Abgabestelle (60) überträgt, wobei jede nachfolgende Übertragungstrommel (50) wenigstens den Teil der einzelnen thermoplastischen Beutel, die von der ersten Übertragungstrommel (40) übertragen werden, an jede nachfolgende Abgabestelle (70) abgibt;
- daß mehrere Wellen vorhanden sind, wobei eine Welle nahe jeder Übertragungstrommel (40, 50) für eine Umlaufbewegung angeordnet ist, und eine Antriebseinrichtung für jede Welle vorhanden ist;
- mehrere Finger (62) an jeder Welle befestigt sind und sich in die ringförmige Nut an den Übertragungstrommelnl (40, 50) erstrecken; und
- die Einrichtung zur Übertragung es ermöglicht, einzelne thermoplastische Beutel sequentiell von der Übertragungstrommel zu den mehreren Abgabestellen zu übertragen.

4. Vorrichtung nach Anspruch 1, weiterhin **dadurch gekennzeichnet, daß**

- mehrere Abgabestellen vorhanden sind,
- eine Einrichtung zur Abgabe einer Reihe von einzelnen flexiblen thermoplastischen Beuteln sequentiell an mehrere Übertragungsstellen vorhanden ist;
- eine Einrichtung zur Übertragung einzelner der thermoplastischen Beuteln von jeder der mehreren Übertragungsstellen zu mehreren Abgabestellen vorhanden ist; und
- die Übertragungseinrichtung mehrere Vakuumübertragungstrommeln (40, 50) aufweist, von denen jede der Übertragungstrommeln mehrere ringförmige Nuten um deren Umfang aufweist, sowie Einrichtungen zum Drehen der Übertragungstrommeln, wobei die Trommeln so angeordnet sind, daß die erste der mehreren Übertragungstrommeln (40) thermoplastische Beutel von der Erzeugungseinrichtung (24) an einer ersten Übertragungsstelle aufnimmt, und jede nachfolgende Trommel (50) einzelne thermoplastische Beutel von der Erzeugungseinrichtung (24) an jeder nachfolgenden Übetragungsstelle aufnimmt, wobei die erste Übertragungstrommel wenigstens einen Teil der einzelnen thermoplastischen Beutel an eine erste Abgabestelle (60) abgibt und jede nachfolgende Trommel (50), die an jeder nachfolgenden Übertragungsstelle liegt, wenigstens einen Teil der einzelnen thermoplastischen Beute an die nachfolgende Abgabestelle (70) abgibt; und
- die Einrichtung zur Übertragung es ermöglicht, einzelne thermoplastische Beutel sequentiell von den Übertragungstrommeln zu den mehreren Abgabestellen zu übertragen.

5. Vorrichtung nach einem der Ansprüche 1 bis 4, bei der die Oberflächen der Finger (62) ein sägezahnartiges Muster (620), ein Fischschuppenmuster oder eine Reihe von abgewinkelten Vorsprüngen (62b) haben.

6. Verfahren zum sequentiellen Transportieren von einzelnen flexiblen thermoplastischen Beuteln, bestehend aus den folgenden Schritten:

- eine kontinuierliche gefaltete Bahn thermoplastischen Materials wird geschnitten und geschweißt, und eine Reihe von einzelnen flexiblen thermoplastischen Beutein wird hergestellt,
- eine Reihe von einzelnen flexiblen thermoplastischen Beutein wird an eine Übertragungsstelle abgegeben,
- die flexiblen thermoplastischen Beutel werden von der Übertragungsstelle zu einer oder mehreren Übertragungsstellen übertragen,

dadurch gekennzeichnet, daß

- das Schneiden und Schweißen mittels mehrerer Schweißstangenanordnungen (20) und mehrerer Heizdrahtschneid- und Schweißelementanordnungen (26) durchgeführt wird;
- die flexiblen thermoplastischen Beutel werden auf eine sich drehende Vakuum-Übertragungstrommel übertragen, die mehrere ringförmige Nuten um deren Umfang hat; und
- die flexiblen thermoplastischen Beute werden sequentiell von der Übertragungstrommel abgenommen und an eine oder mehrere Abgabestellen mittels mehrerer Finger abgegeben, die sich in die ringförmigen Nuten erstrecken und die flexiblen thermoplastischen Beute sequentiell von der Übertragungstrommel abnehmen und sie einen oder mehrere Übertragungsstellen abgeben, wobei die Finger Oberflcähen haben, die die flexiblen thermoplastischen Beutel berühren können, die Oberflächen der Finger, die die Beute berühren, einen selektiven Reibungswiderstand erzeugen, um die Beutel zu verzögern, wenn sie von der Übertragungstrommel abgenommen und

gegen einen Anschlag gestapelt werden, und sich die Finger über im wesentlichen die volle Breite der flexiblen thermoplastischen Beute erstrecken und diese berühren, wenn die thermoplastischen Beutel von der Übertragungstrommel entfernt und gegen einen Anschlag gestapelt werden.

7. Verfahren nach Anspruch 6, bei dendie flexiblen thermoplastischen Beute von der Übertragungsstelle zu mehreren Abgabestellen übertragen werden, und wobei die Finger mit einer Geschwindigkeit von 1/X der Geschwindigkeit betrieben werden, mit der die flexiblen und thermoplastischen Beute zu der Übertragungsstelle geliefert werden, wobei X die Anzahl der Abgabestellen pro Bahn der flexiblen thermoplastischen Beute ist, die an die Übertragungsstelle abgegeben werden.

8. Verfahren nach Anspruch 6 oder 7, bei dem das Verhältnis des Umlaufbahndurchmessers der Finger zur Breite der flexiblen thermoplastischen Beute gleich oder weniger als 0,7 ist.

9. Umlaufbahn-Umsetzervorrichtung (60) zur Verwendung in Verbindung mit einer Vorrichtung zum sequentiellen Transport einzelner flexibler thermoplastischer Beutel, wobei der Umlaufbahnumsetzer zum Abnehmen der thermoplastischen Beute von einer Übertragungstrommel aufweist:

- eine Welle (94), die zur Umlaufbewegung angeordnet ist und eine Antriebserinrichtung zum Umlaufen der Wellehat; und
- mehrere Finger (62), die an der Welle (94) befestigt sind;

dadurch gekennzeichnet, daß
die Finger Oberflächen haben, die die flexiblen thermoplastischen Beutel berühren können, wobei die Oberflächen einen selektiven Reibungswiderstand zwischen den flexiblen thermoplastischen Beuteln und den Fingern derart erzeugen, daß ein hoher Reibungsgrad erzeugt wird, wenn die flexiblen thermoplastischen Beutel sich mit einer hohen Geschwindigkeit relativ zu den Fingeroberflächen bewegen und ein niedriger Wirkungsgrad erzeugt wird, wenn die Geschwindigkeit der Fingeroberflächen relativ zur Geschwindigkeit der flexiblen thermoplastischen Beute zunimmt.

10. Vorrichtung nach Anspruch 9, bei der die Oberflächen der Finger (62) ein Sägezahnmuster (62a), ein Fischschuppenmuster oder eine Reihe von abgewinkelten Vorsprüngen (62b) haben.

Revendications

1. Appareil pour la fabrication et la manipulation séquentielle de sacs souples en matière thermoplastique, comprenant:

un moyen (20, 26) pour sectionner et sceller une bande continue pliée de matière thermoplastique et former une série de sacs individuels (28) en matière thermoplastique;

un moyen (24) pour distribuer la série de sacs souples en matière thermoplastique à un point de transfert;

un moyen (40) positionné audit point de transfert pour transférer lesdits sacs souples en matière thermoplastique jusqu'à un point de distribution,

caractérisé en ce que

ledit moyen pour sectionner et sceller comprend une pluralité d'ensembles (20) de barres de scellement et une pluralité d'ensembles (26) d'éléments de sectionnement et de scellement à fil métallique chauffé;

ledit moyen pour transférer les sacs en matière thermoplastique jusqu'à un point de distribution comprend un tambour (40) de transfert à aspiration comportant une pluralité de rainures circulaires (69) sur son pourtour et un moyen (41) pour faire tourner ledit tambour;

un arbre (94) monté de façon adjacente audit tambour de transfert (40) en vue d'une mouvement orbital, comprenant un moyen d'entraînement pour communiquer un mouvement orbital audit arbre;

une pluralité de doigts (62) fixés audit arbre et s'étendant jusque dans lesdites rainures circulaires pour retirer lesdits sacs souples en matière thermoplastique dudit tambour de transfert et délivrer les sacs souples en matière thermoplastique audit point de distribution;

un moyen pour espacer les sacs en matière thermoplastique sur le tambour de transfert (40) afin de permettre aux doigts (62) d'appareil d'emballage retirer les sacs (28) en matière thermoplastique du tambour de transfert (40) sans rencontrer un sac suivant;

les doigts (62) retirant les sacs souples individuels successifs en matière thermoplastique séquentiellement du tambour de transfert et les doigts comportant des surfaces adaptées pour contacter lesdits sacs en matière thermoplastique, lesdites surfaces des doigts en contact avec les sacs engendrant une résistance de frottement sélective pour décélérer les sacs au fur et à mesure qu'ils sont retirés du tambour de transfert et empilés contre une butée d'appui, et lesdits doigts s'étendant sur et contre sensiblement toute la largeur desdits sacs souples en matièr thermoplastique sans venir en contact avec le bord avant du sac immédiatement suivant présent sur le tambour de transfert

au fur et à mesure que les sacs souples en matière thermoplastique sont retirés du tambour de transfert et empilés contre la butée d'appui.

2. Appareil selon la revendication 1, caractérisé, en outre, par:

une pluralité de points de distribution;

le tambour de transfert (40) comprenant une pluralité de premiers et seconds segments alternés, lesdits premiers segments (42b) pouvant être déplacés transversalement au trajet desdits sacs souples en matière thermoplastique, lesdits premiers segments (42b) étant adaptés pour accepter un sur deux desdits sacs souples en matière thermoplastique en provenance dudit point de transfert et comprenant des orifices d'aspiration (46) communiquant avec une source de vide pour assujettir les bords avant desdits sacs souples en matière thermoplastique, lesdits seconds segments (42a) étant adaptés pour accepter un sur deux desdits sacs souples en matière thermoplastique et un moyen (56-64) pour déplacer lesdits premiers segments transversalement au trajet des sacs souples en matière thermoplastique: et

ledit moyen pour transférer permettant aux sacs individuels en matière thermoplastique d'être transférés séquentiellement depuis lesdits premiers et seconds segments jusqu'à une pluralité de points de distribution.

3. Appareil selon la revendication 1, caractérisé, en outre, par:

une pluralité de points de décharge;

ledit moyen pour traansférer comprenant une pluralité de tambours de transfert à aspiration (40, 50), chacun desdits tambours comportant une pluralité de rainures circulaires sur son pourtour, et un moyen pour faire tourner chacun desdits tambours de transfert;

les tambours de transfert (40, 50) étant disposés de manière telle que le premier tambour de ladite pluralité de tambours de transfert (40) accepte les sacs en matière thermoplastique en provenance dudit moyen de distribution (24) et transfère au moins une partie desdits sacs individuels en matière thermoplastique jusqu'à un tambour de transfert suivant (50) et au moins une partie desdits sacs individuels en matière thermoplastique jusqu'à un premier point de distribution (60), chaque tambour de transfert suivant (50) distribuant au moins la partie desdits sacs individuels en matière thermoplastique, qui est reçue dudit premier tambour de transfert (40), à chaque point de distribution suivant (70);

une pluralité d'arbres, à raison d'un monté de façon adjacente à chacun desdits tambours de transfert (40, 50) en vue d'un mouvement orbital, comprenant un moyen d'entraînement pour chaque arbre;

une pluralité de doigts (62) étant fixés à chaque arbre et s'étendant jusque dans lesdites rainures circulaires se trouvant sur lesdits tambours de transfert (40, 50) et

ledit moyen de transfert permettant aux sacs individuels en matière thermoplastique d'être transférés séquentiellement depuis lesdits tambours de transfert jusqu'à la pluralité de points de distribution.

4. Appareil selon la revendication 1, caractérisé en outre par:

une pluralité de points de distribution;

un moyen pour fournir une série de sacs souples individuels en matière thermoplastique séquentiellement à une pluralité de points de transfert;

un moyen pour transférer un par un lesdits sacs en matière thermoplastique depuis chaque points de transfert de ladite pluralité de points de transfert jusqu'à une pluralité de points de distribution; et

ledit moyen de transfert comprenant une pluralité de tambours de transfert à aspiration (40, 50), chacun desdits tambours de transfert comportant une pluralité de rainures circulaires sur son pourtour, et un moyen pour faire tourner lesdits tambours de transfert, lesdits tambours étant disposés de manière telle que le premier desdits tambours de ladite pluralité de tambours de transfert (40) accepte les sacs en matière thermoplastique en provenance dudit moyen de distribution (24) à un premier point de transfert et chaque tambour de transfert suivant (50) accepte les sacs individuels en matière thermoplastique en provenance dudit moyen de distribution (24) à chaque point de transfert suivant, ledit premier tambour de transfert distribuant au moins une partie desdits sacs individuels en matière thermoplastique à un premier point de décharge (60) et chaque tambour de transfert suivant (50) se trouvant à chaque point de transfert suivant distribuant au moins une partie desdits sacs individuels en matière thermoplastique au point de distribution suivant (70); et

ledit moyen de transfert permettant aux sacs individuels en matière thermoplastique d'être transférés séquentiellement depuis lesdits tambours de transfert jusqu'à la pluralité de points de distribution.

5. Appareil selon l'une quelconque des revendications 1 à 4, dans lequel les surfaces des doigts (62) comportent un motif en dents de scie (620), un motif en écailles de poisson ou une série de saillies angulaires (62b).

6. Procédé pour la manipulation séquentielle de sacs souples individuels en matièr thermoplastique comprenant les étapes consistant:

a sectionner et sceller une bande pliée continue de matière thermoplastique et à former une série de sacs souples individuels en matière thermoplastique,

à distribuer une série de sacs souples individuels à un point de transfert;

à transférer les sacs souples en matière thermoplastique depuis le point de transfert jusqu'à un ou plusieurs points de distribution;

caractérisé en ce que:

on effectue le sectionnement et le scellement au moyen d'une pluralité d'ensembles (20) de barres de scellement et d'une pluralité d'ensembles (26) d'éléments de sectionnement et de scellement à fil métallique chauffé;

on transfère les sacs souples en matière thermoplastique jusque sur un tambour de transfert rotatif a aspiration comportant une pluralité de rainures circulaires sur son pourtour; et

on retire les sacs souples en matière thermoplastique séquentiellement du tambour de transfert et on les distribue à un ou plusieurs points de distribution en utilisant une pluralité de doigts qui s'étendent jusque dans les rainures circulaires et qui retirent les sacs souples en matière thermoplastique séquentiellement du tambour de transfert et les distribuent à un ou plusieurs points de distribution, les doigts comportant des surfaces adaptées pour venir en contact avec les sacs souples en matière thermoplastique, lesdites surfaces des doigts en contact avec les sacs exerçant une résistance de frottement sélective pour décélérer les sacs au fur et à mesure qu'ils sont retirés du tambour de transfert et empilés contre une butée d'appui, et les doigts s'étendant sur et contre sensiblement toute la largeur des sacs souples en matière thermoplastique au fur et à mesure que les sacs en matière thermoplastique sont retirés du tambour de transfert et empilés contre la butée d'appui.

7. Procédé selon la revendication 6, dans lequel on transfère les sacs souples en matière plastique depuis le point de transfert jusqu'à une pluralité de points de distribution et dans lequel on actionne les doigts à une vitesse de 1/X fois la vitesse à laquelle les sacs souples en matière thermoplastiques sont fournis au point de transfert, sachant que X est le nombre de points de distribution par trajet de sacs souples en matière thermoplastique distribués au point de transfert.

8. Procédé selon la revendication 6 ou la revendication 7, dans lequel le rapport du diamètre d'orbite des doigts à la largeur des sacs souples en matière thermoplastique est égal ou inférieur à environ 0,7.

9. Appareil d'emballage (60) à mouvement orbital, destiné à être utilisé en combinaison avec un appareil servant à manipuler séquentiellement des sacs souples individuels en matière thermoplastique, ledit appareil d'emballage à mouvement orbital servant à retirer lesdits sacs en matière thermoplastique d'un tambour de transfert comprenant:

un arbre (94) monté en vue d'un mouvement orbital, comprenant un moyen d'entraînement pour faire décrire un mouvement orbital à l'arbre; et

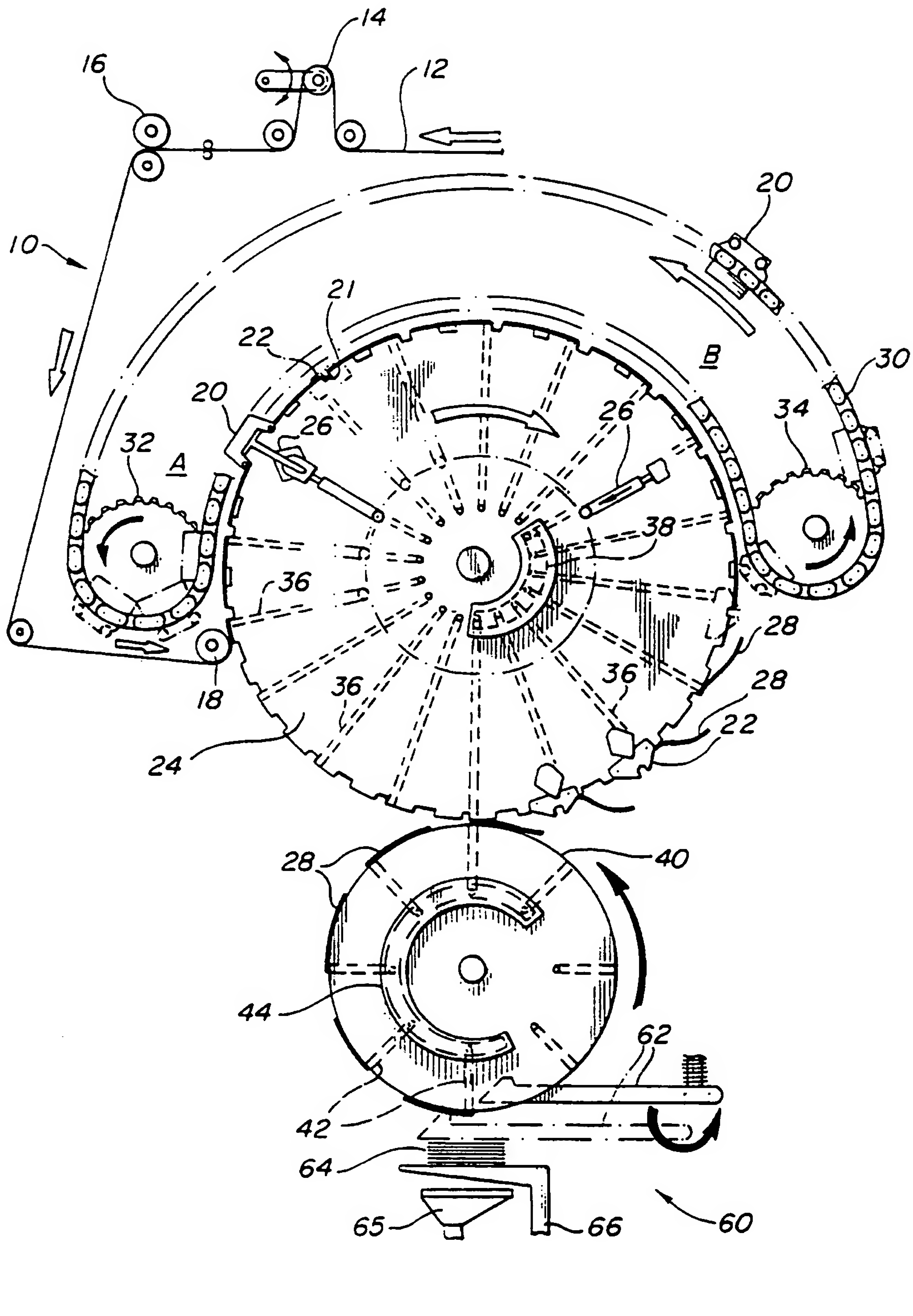
une pluralité de doigts (62) fixés à l'arbre (94);

caractérisé en ce que

les doigts comportent des surfaces adaptées pour venir en contact avec les sacs souples en matière thermoplastique, ces surfaces exerçant une résistance de frottement sélective entre les sacs souples en matière thermoplastique et les doigts par le fait qu'un degré élevé de frottement a lieu quand les sacs souples en matière thermoplastique sont déplacés à une vitesse élevée par rapport aux surfaces des doigts et un faible degré de frottement a lieu quand la vitesse des surfaces des doigts augmente par rapport à la vitesse des sacs souples en matière thermoplastique.

10. Appareil selon la revendication 9, dans lequel les surfaces des doigts (62) portent un motif (62a) en dents de scie, un motif en écailles de poisson ou une série de saillies angulaires (62b).

FIG-1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22
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FIG-2A

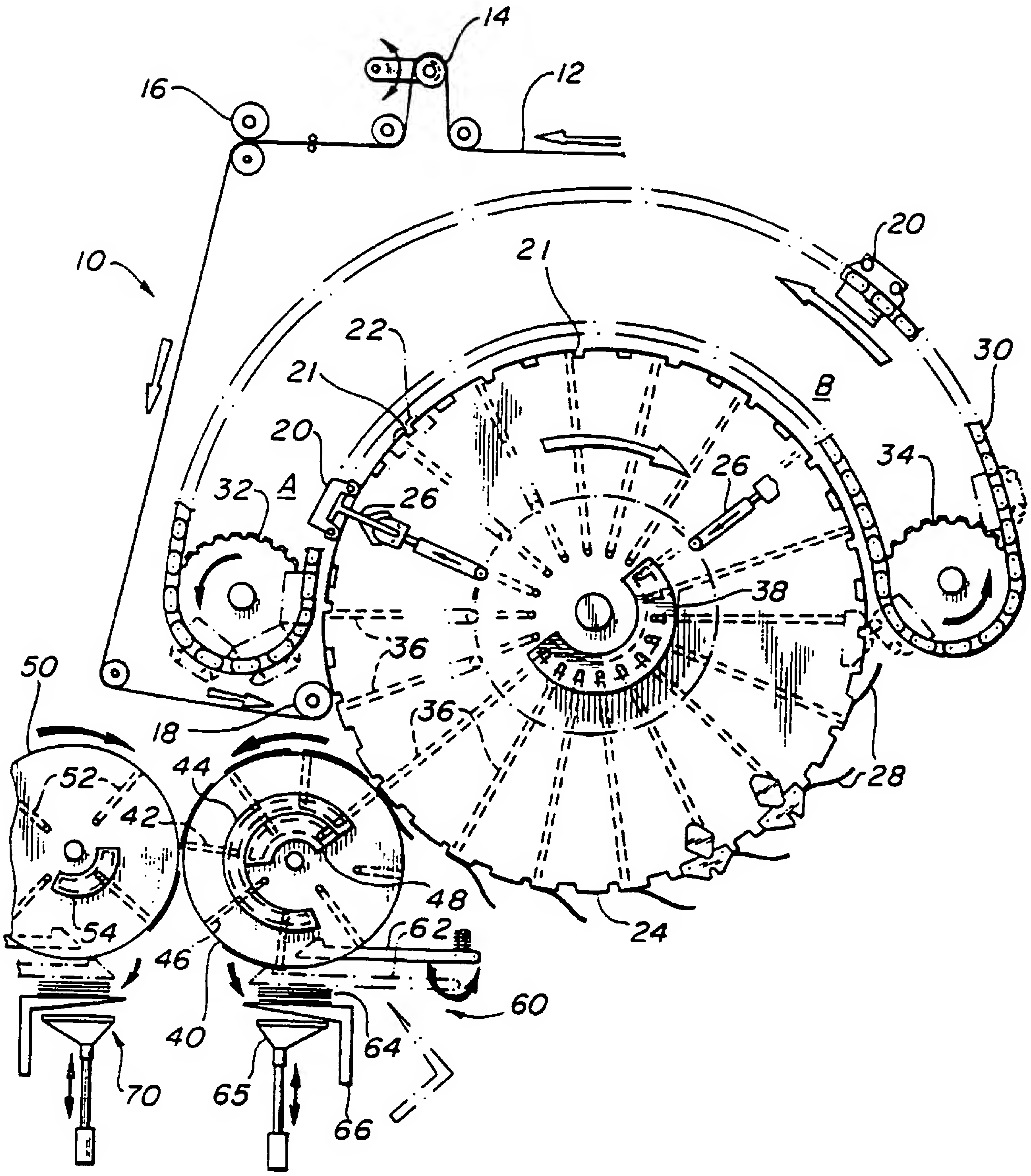
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FIG-2B

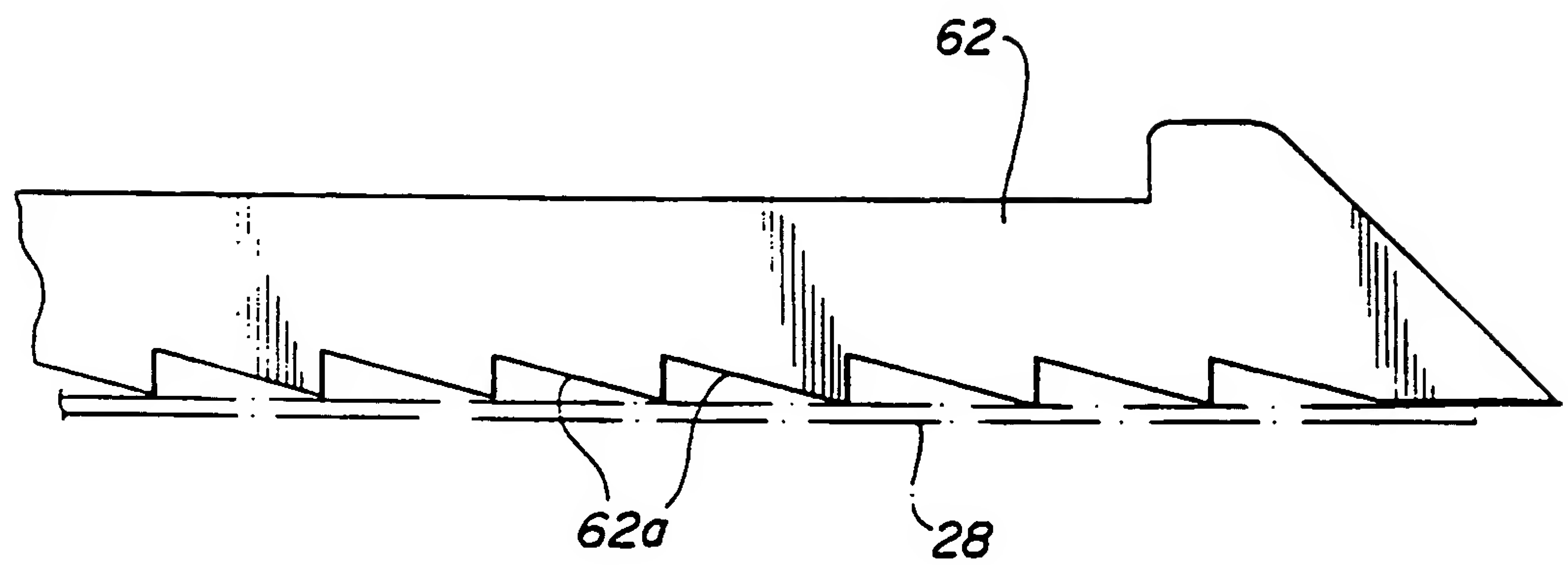


FIG-2C

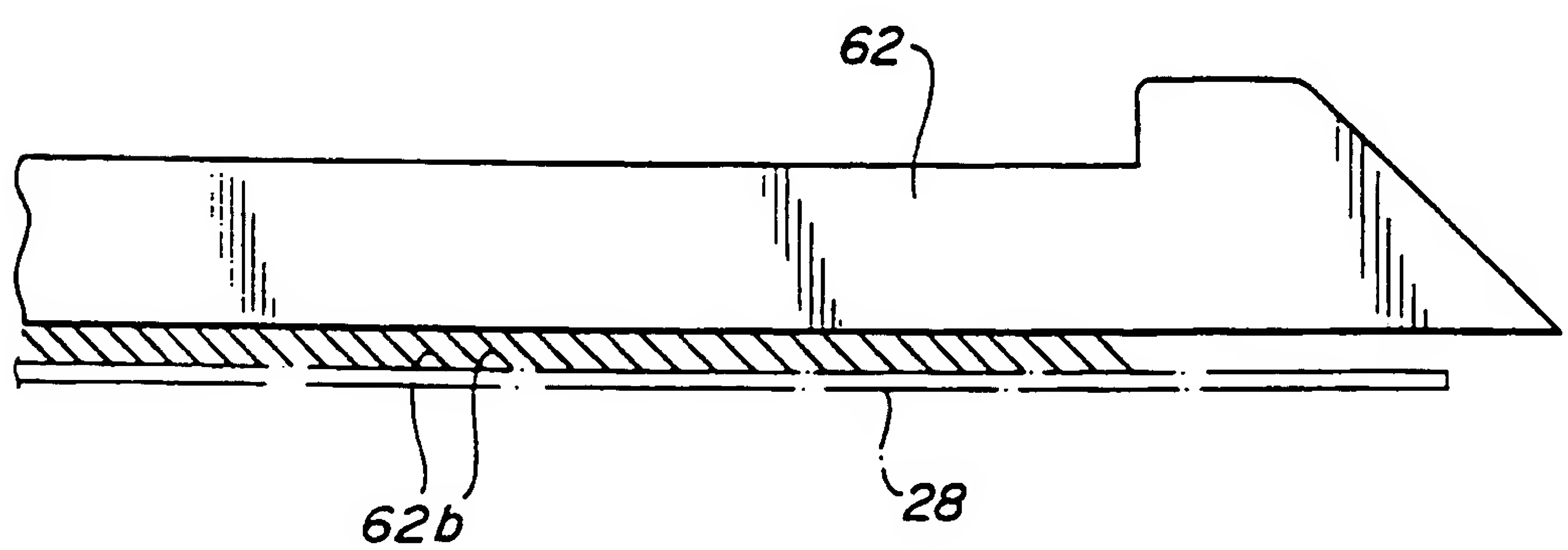


FIG-3

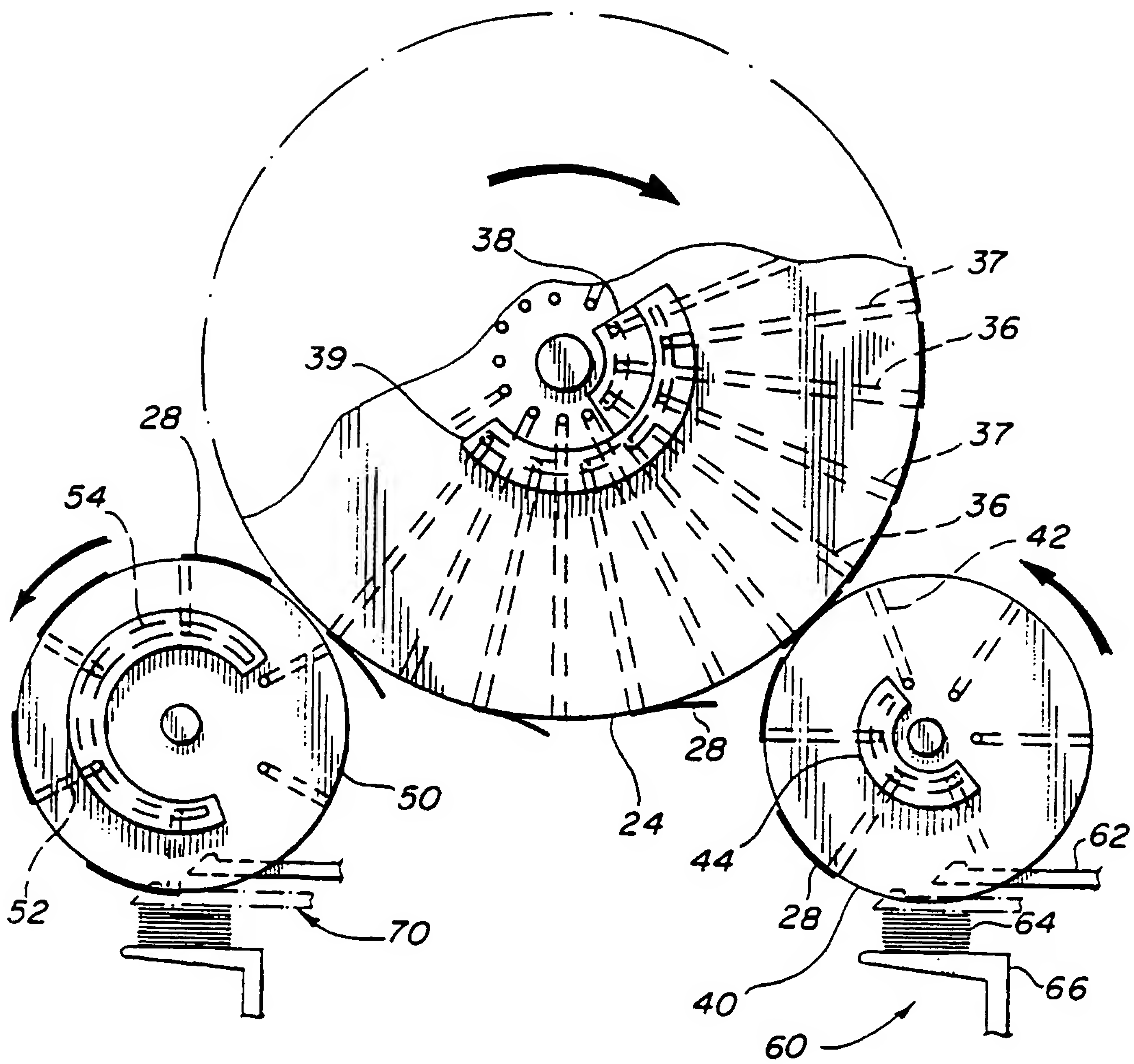


FIG-4

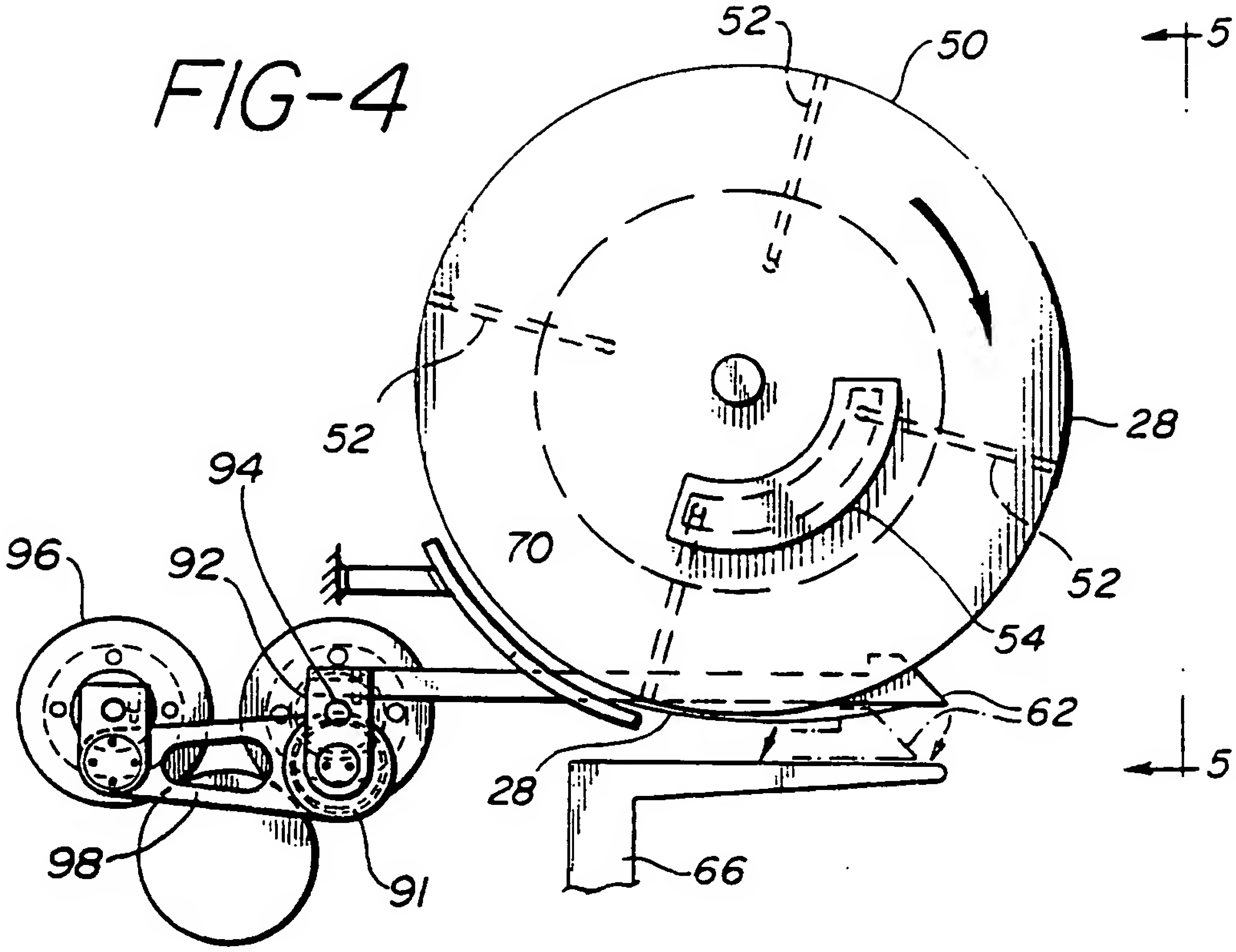


FIG-5

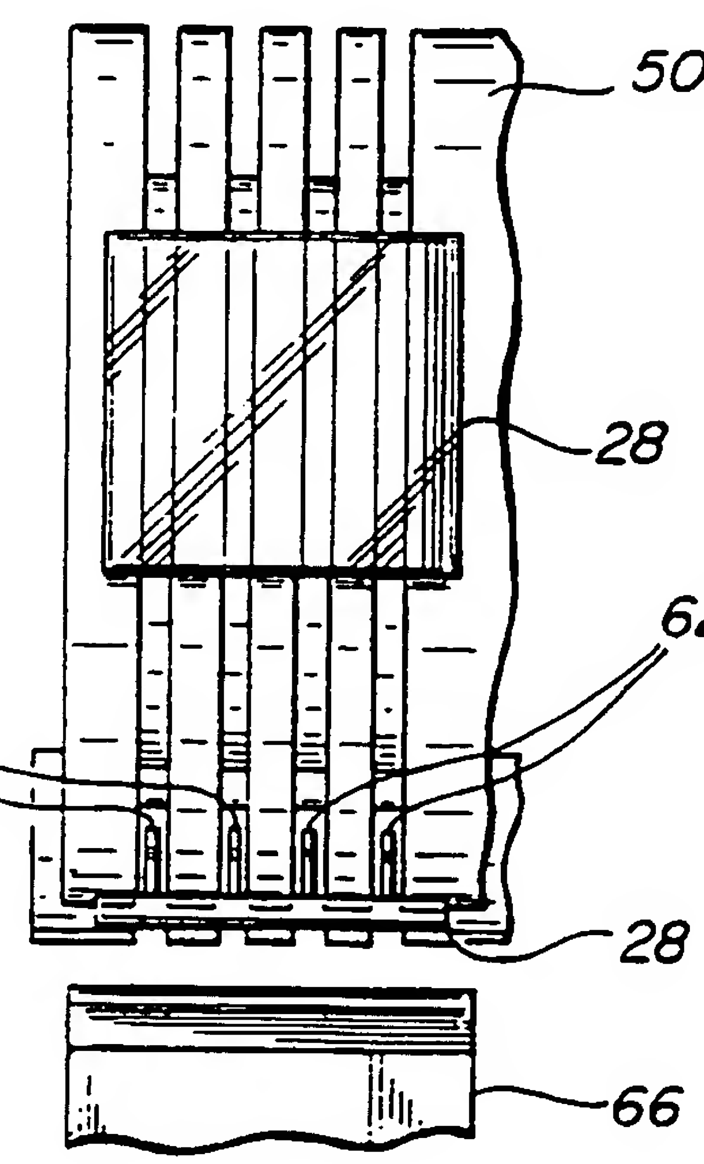
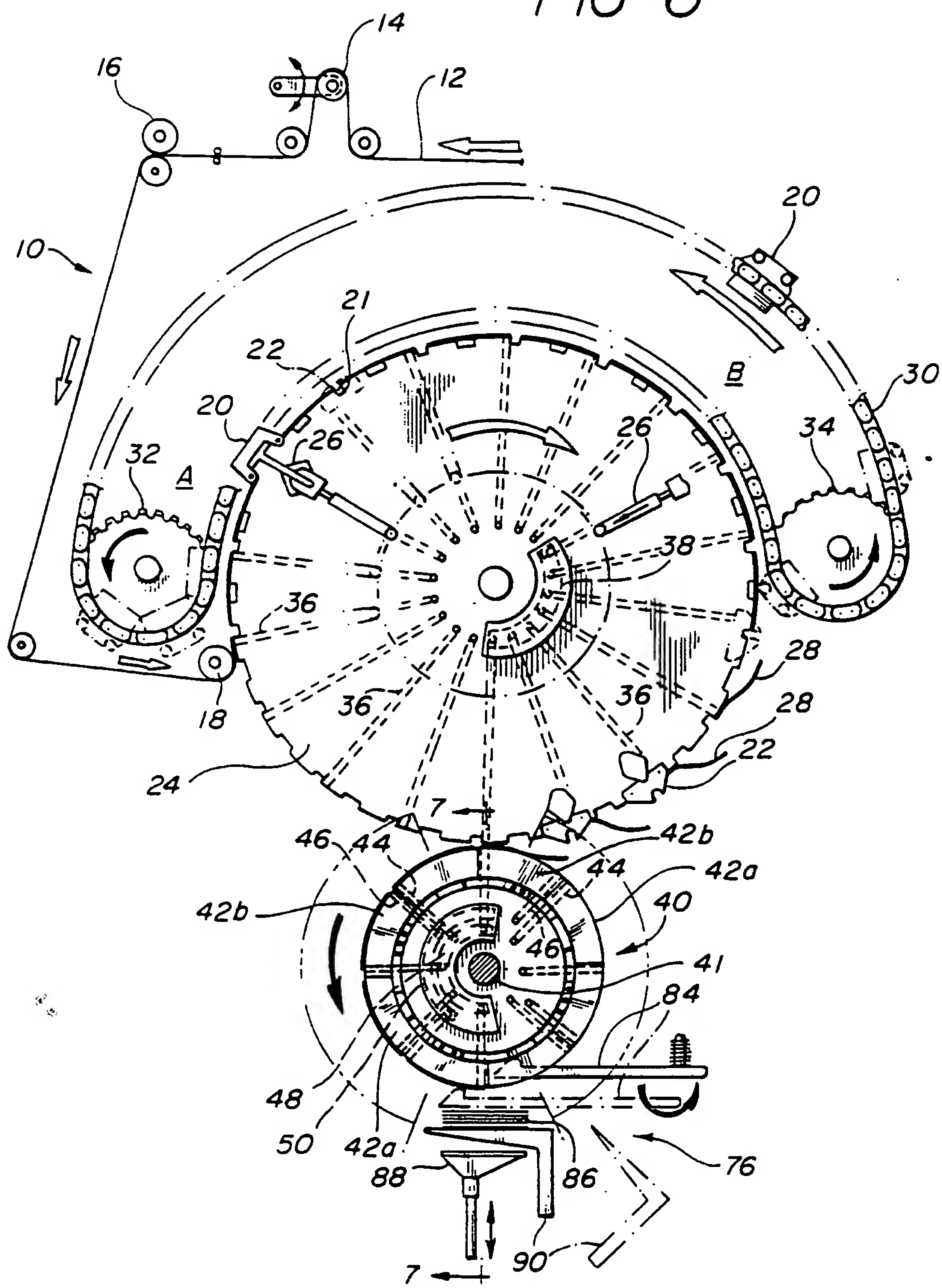


FIG-6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32
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36
38
A
B
40
41
42a
42b
44
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48
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84
86
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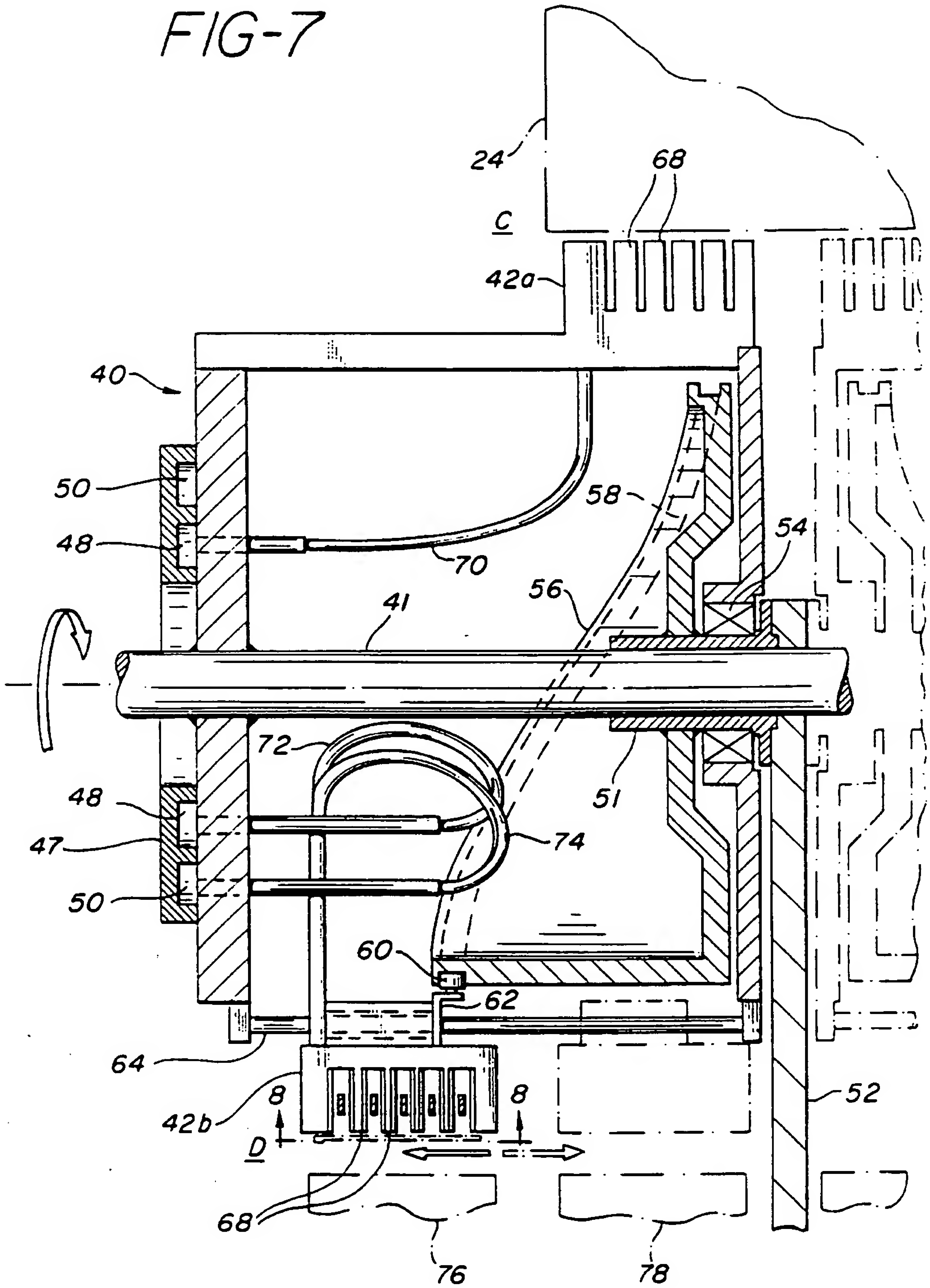
90

FIG-7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68
C
42a
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50
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58
54
70
56
41
72
51
48
47
74
50
60
62
64
52
8
8
42b
D
68
76
78

FIG-8